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# Recommendations for Improving the Bureau of Medicine Information System

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#### ABSTRACT

The Bureau of Medicine Information System (BUMIS) contains computerized records of all individuals in the Medical Corps. This research memorandum identifies some of the limitations of this data set for the analysis of physician retention and makes recommendations for improving the BUMIS.

## EXECUTIVE SUMMARY

The Bureau of Medicine Information System (BUMIS) contains computerized records of all Navy Medical Corps personnel. Recent CNA analyses of physician retention from FY 1984 through FY 1988 relied heavily on information from BUMIS. This research memorandum identifies some limitations of the BUMIS data set for analyzing physician retention, describes the procedures used to overcome these limitations, and recommends ways to improve the data for future analyses.

Recent CNA analyses of physician retention focused on three areas. The first area was the identification of key retention decision points in a Navy medical officer's career. The second area of analysis was to determine physician retention by clinical specialty. The last area of analysis was estimating the statistical relationship between physician pay and retention. Data problems limited the scope of the analysis in each of these analytical areas.

### IDENTIFICATION OF KEY RETENTION DECISION POINTS

A Navy physician reaches a retention decision point only after completing any active duty obligation. The first decision point, termed the end of initial obligation, is particularly important because at that point, the physician decides whether to make a long-term commitment to the Navy based on the relative benefits of a Navy medical career.

Identification of the end of initial obligation requires extensive knowledge of the various types of accession and training obligations that Navy physicians incur. Most of the required information is available on BUMIS. However, the identification of the end of initial obligation would be considerably simplified if BUMIS included a variable recording the length of the obligation that a physician incurs through an accession program. For physicians accessing under the Armed Forces Health Professions Scholarship Program (AFHPSP), this obligation ranges from two to four years. For direct accessions (volunteers), this obligation ranges from one to three years.

Without information on the length of the accession obligation, the end of initial obligation cannot be determined exactly and must be identified from the physician's obligated service date (OSD), a variable recording the end of the physician's most recent obligation. The identification procedure used by CNA relies on the fact that the OSD reflects only accession and training obligations. The recent use of this field to include obligations under the Medical Officer Retention Bonus (MORB) may invalidate future use of the procedures developed by CNA to identify the end of initial obligation and make it difficult to analyze retention after FY 1988.



## **SPECIALTY RETENTION RATES**

BUMIS is the sole source of accurate information on the clinical specialties of physicians. A recent CNA analysis revealed wide variation in retention rates by clinical specialty. However, relatively frequent changes in both specialty coding and the classification of physicians in executive medicine billets makes it difficult to create specialty classifications that are consistent over time. Specialties must be consistently defined in order to make examination of retention trends a useful analytical tool. However, coding changes, most recently in FY 1988, have not preserved the correspondence between old and new codes. In addition, physicians in executive medicine billets are presently included in the clinical specialties but have been identified as a separate specialty at other times.

## **CONSTRUCTING A STATISTICAL MODEL OF PAY AND RETENTION**

A physician's decision to remain in the Navy depends on a number of factors including the civilian-military pay differential. Estimates of the magnitude of the effect of the pay differential on retention enable the Navy to evaluate the retention effects of alternative proposals to increase military pay for physicians. However, these estimates must be quantified within a statistical model that contains an accurate measure of the pay differential and that controls for other factors that affect the decision to leave.

The major problem with the construction of a statistical model of physician pay and retention is the lack of pay and pay-related information on BUMIS. Both regular military compensation (RMC) and physician special pays were constructed for each physician from information on rank, years of service, presence of dependents, specialty, training status, and board certification. Information on dependents in BUMIS is poor. This information is needed both to construct RMC and to serve as a control variable in the retention model. The fields in BUMIS devoted to special pays are not kept up to date to reflect changes in entitlement or amounts.

## **SUMMARY AND RECOMMENDATIONS**

Medical Corps data in BUMIS provide very detailed information on Navy physicians. However, improvements in the data would improve the accuracy and timeliness of future analyses of physician retention. Three major recommendations to improve BUMIS are

- Begin recording the number of years of obligation that a physician incurs through accession. This change will make identification of the end of initial obligation, the first key retention decision point in a military physician's career, more accurate and more timely. In the meantime, the OSD should not be used to record changes in the physician's obligation status under the MORB.

- Ensure that changes in the coding of specialties permit preservation of specialty classifications over time so that specialty trends can be used as indicators of retention problems.
- Improve the accuracy of pay and pay-related variables to enhance the usefulness of BUMIS data in assessing the influence of pay on retention.

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## INTRODUCTION

The Bureau of Medicine Information System (BUMIS) contains computerized records of all individuals in the Medical Corps. CNA obtained copies of the Medical Corps records for FY 1983 through FY 1988 in order to study the retention of physicians in the Navy. This research memorandum identifies some limitations of the BUMIS data set for analyzing physician retention. It also describes the procedures used to overcome these limitations and recommends ways to improve the data for future analyses.

A recent CNA study examined physician retention in the aggregate, by specialty, and at the end of initial obligation. Statistical models were estimated that related the civilian-military pay differential and other factors to physician retention. The results of these efforts appear in [1], [2], [3], and [4]. In each phase of the study, data problems limited the scope of the analysis. The recommended solutions to these problems fall into one of three categories: creation of a new data field, improved maintenance of an existing data field, or improved consistency in defining a data field over time.

The remainder of this paper is organized into three parts that correspond to the three major parts of the physician retention study. Each section describes the major data limitations that affected that part of the study and suggests some solutions.

## RETENTION AT THE END OF INITIAL OBLIGATION

One goal of the CNA study was to identify key retention decision points for Navy physicians. A true decision point occurs only when the physician is free of any obligation to serve in the Navy. The first decision point is particularly important because at that point, termed the end of initial obligation, the physician decides whether to make a long-term commitment to the Navy based on the relative benefits of a Navy medical career.

Physicians incur obligations through their accession program,<sup>1</sup> Navy-sponsored graduate medical education (GME), augmentation, and for certain special pays. Because most physicians specialize early in their careers, they typically begin GME while under obligation for their accession program. Because time in GME does not count against obligation

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1. Physicians currently enter military service through the Armed Forces Health Professions Scholarship Program (AFHPSP), through the Uniformed Services University of the Health Sciences (USUHS), or as direct accessions. AFHPSP and USUHS accessions agree to serve for four and seven years respectively for full participation in these programs in exchange for their medical school education. Direct accessions typically enter fully trained and incur a contract obligation of two to four years.

for accession, the accession obligation typically overlaps the obligation for GME. The initial obligation for a specialist was defined in [1] to include both obligation for accession and any additional obligation for GME. The initial obligation for a general medical officer (GMO) is the accession obligation. The analysis examined retention of GMOs and specialists separately because only specialists have well-defined civilian alternatives.<sup>1</sup> For a specialist reaching the end of initial obligation, the decision to stay or leave is based on the relative benefits of practicing in the Navy. For a GMO, the decision may be based on whether to obtain training in the military or civilian sector as well.

The decision to exclude obligation for augmentation from the initial obligation reflects the observation that few physicians augment and those that do typically do so after making a career decision. Additional special pay (ASP) and incentive special pay (ISP) require a one-year commitment to remain on active duty. However, obligation for pay can be discharged concurrently with any other obligations. Furthermore, because pay contracts are renewed each fiscal year, the physician who plans to leave during a given fiscal year need not sign a pay contract. Since most ASP contracts run from July to June and most physicians reach the end of initial obligation during the summer, the decision to accept ASP can be made concurrently with the decision to stay in the Navy. Most ISP contracts run from October to September and may hold physicians in the Navy for a few months past the end of initial obligation.

For most specialists, the obligated service date (OSD) in BUMIS can be used to identify the end of the initial obligation. The OSD in a given year contains the date on which the officer's most recent obligation ends. The OSD does not include obligation for pay.<sup>2</sup> In most cases, the first OSD after completing residency training indicates the end of the initial obligation. However, physicians who undertake more than one residency pose special problems. Conceptually, the physician's obligation status at the beginning of the training should determine whether to consider the additional training and obligation part of the initial obligation. If a physician is obligated at the beginning of a second residency, the additional training and obligation is considered part of the initial obligation. However, information on obligation status is not always available.

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1. Physicians who had at least a residency begin date but who were coded with a GMO subspecialty were analyzed separately from the other two types of physicians. These individuals may be specialists who have lost their privileges or never had their subspecialty code updated, or physicians who failed to complete the residency. The data do not allow the reason to be determined in individual cases.

2. BUMIS contains separate fields to track ISP and ASP contract dates and amounts.

The obligation status of a physician at the beginning of a second (or third) residency that started in FY 1983 or later can be determined from the physician's OSD in that year. However, the obligation status of a physician at the beginning of a second residency that started before FY 1983 cannot be determined from the FY 1983 record, since BUMIS data for earlier years are not reliable. (Because start and completion dates for up to three residencies or fellowships are recorded in BUMIS, it is possible to identify past training periods from current data.) The procedure adopted in the study was to consider any physician who began a second residency within two years of completing the first as obligated at the beginning of the second. Because physicians must serve for a minimum of two years after completing a residency, this procedure did not mistakenly identify unobligated physicians as obligated. However, some physicians who were in fact under obligation when they began a second residency were treated as if they were not.

The OSD alone could not be used to identify the end of initial obligation in cases in which the recorded date clearly occurred beyond any reasonable bound for an initial obligation. In some cases, the end of the obligation given by the OSD was an obligation incurred after the initial obligation ended. This problem occurred most often with direct accessions who extended their initial contract and with physicians who augmented. The obligated service code (OSC) could help determine whether the physician did extend a contract or augment, because codes for these occurrences do exist. However, these codes have not been entered consistently and are not considered reliable indicators of the reason for the obligated service. More consistent recording of the OSC would improve its reliability and would make it easier to identify initial obligations. However, there would still be ambiguity in how to use the codes when two types of obligations overlap.

The problem of identifying the end of an officer's initial obligation would be considerably simplified with the addition of a variable containing the number of years of obligation that the physician incurs through accession. This information is the most important missing piece of information needed to identify precisely the physician's initial obligation period. Including a variable that directly measures the length of the accession obligation in the BUMIS data set would simplify the task of distinguishing initial and subsequent terms of obligation.<sup>1</sup> It is not possible to determine obligation for accession program from the OSD.

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1. An alternative method would be to stack OSDs, creating a separate field with each change in obligated service. The OSC would need to be stacked and changed as well. However, the information on length of obligation is more fundamental in that the OSD in any given year can always be constructed from data on length of accession obligation and participation in other obligation programs.

The introduction of multi-year pay contracts under the Medical Officer Retention Bonus (MORB) in FY 1989 will further complicate the analysis of physician retention at the end of initial obligation. Eligible physicians may receive a bonus that varies by specialty grouping and years of service obligation. The physician can choose a two-, three-, or four-year contract and receive a higher bonus for a longer commitment. Unlike the obligation for ASP and ISP, the obligation for the MORB is additive to any current medical education and training obligation. In addition, obligated physicians may contract for the MORB in FY 1989 if their obligation ends before the end of FY 1991. This creates the possibility that a physician whose initial obligation ends in FY 1991 contracts in FY 1989 for a two-year MORB contract that commits him to remain in the Navy until FY 1993. The physician effectively chooses to remain in the Navy beyond the end of initial obligation before reaching that point.

The decision framework created by the MORB differs from the one that physicians faced from FY 1983 through FY 1988. In the earlier period, it was reasonable to assume that the physician made the decision to stay or leave based on a comparison of the civilian and military career opportunities in the year in which his initial obligation ended. Because the MORB rules allow obligated physicians to enter multi-year contracts well in advance, the decision and the end of initial obligation need not coincide. These complications make it even more important to maintain the obligation for accession and training separately from obligation for pay. This procedure will allow the greatest flexibility in addressing the issues raised by the MORB in the analysis of retention at the end of initial obligation.

Currently, MEDCOM personnel are updating the OSD for physicians who extend their obligated service through the MORB, using the code "E" (for contract extension) in the OSC field to identify the obligation as a pay contract. However, if this change in OSD is not stacked, the information on the medical education and training obligation may be lost from the physician's current record. This will greatly increase the difficulty of identifying the end of initial obligation for these physicians.

A lack of precise data on the timing of losses also limited the scope of CNA's analysis of retention at the end of initial obligation. Not all physicians who leave do so in the month they complete their initial obligation. A physician who has decided against a military medical career may nonetheless remain in the Navy for several months beyond the end of initial obligation in order to fulfill a pay contract or to conduct a job search. The estimated loss date (ELD) records the year and month of either the anticipated loss or an actual loss.<sup>1</sup> However, in

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1. The ELD could not be used to identify actual losses because the field contains an anticipated date for physicians who may choose to stay. The most accurate indicator of the decision to stay or leave is the delete code that identifies whether a physician is on active duty at the end of the fiscal year.

some years, the ELD for physicians who leave does not appear to have been updated to reflect actual loss dates.

Physicians who leave should typically have an ELD that falls on or after their OSD, because most losses should be voluntary losses of unobligated physicians. Table 1 compares the ELD and OSD of physicians who left the Navy between FY 1984 and FY 1987. A substantial proportion of physicians have an ELD that preceded the OSD, although this percentage has declined over time. Some physicians may fall into this category because they are involuntary losses. However, failure to update the ELD at the time of the loss may be inflating this percentage.

Table 1. Comparison of ELD and OSD for physicians who left the Navy between FY 1984 and FY 1988 (percent)

	1984	1985	1986	1987	1988
ELD = OSD <sup>a</sup>	32	39	38	41	46
ELD > OSD	43	44	46	44	42
ELD < OSD	22	16	14	15	12
Missing data	3	1	2	<1	<1

a. Defined as an OSD that falls within +/- one month of the ELD.

Retention was measured at the end of each fiscal year because the BUMIS variable that records whether a physician is on active duty in a given fiscal year is the most accurate indicator of whether an individual has left the Navy. This procedure groups together physicians who had been unobligated for very different lengths of time, ranging from 1 to 12 months. An alternative and complementary method of analyzing retention is to examine length of service beyond initial obligation. This can be done only very crudely, as in [2], without precise data on the timing of losses.

#### CALCULATING SPECIALTY RETENTION TRENDS

In [3], the results of an analysis of specialty retention revealed wide variation in the retention rates by specialty. The analysis examined retention trends for all physicians and for unobligated physicians within each of 23 specialties. Several problems with the classification of specialties made the calculations more difficult and the results harder to interpret.



The first problem in the analysis of specialty retention is that the subspecialty codes have changed frequently. BUMIS contains variables identifying up to three subspecialties for each physician. One set of specialty codes applies to FY 1983-85 data, a different set to FY 1986 and FY 1987 data, and a third set to FY 1988 data. Increasing specialization among physicians may underlie the decision to introduce new coding systems. However, each time the codes change, the potential for introducing errors into the analysis increases.

Specialties must be consistently defined in order to make retention trends a useful analytical tool. The lack of DOD-wide agreement on requirements for physicians with different specialties means that comparisons with historical levels are the only measure of whether a retention problem exists. However, the validity of historical comparisons rests on the ability to identify specialists in a consistent way over time.

The 1988 change in the subspecialty codes for physicians made it very difficult to maintain the consistency of the specialty categories. In many cases, specialists who had separate codes in the 1986-87 system were recoded into a single code under the 1988 system. For example, anesthesiologists with a subspecialty in critical care medicine had a unique subspecialty code under the old system. Under the new system, the primary specialty for these individuals is coded as critical care, along with other individuals who are not anesthesiologists. Table 2 lists other examples of coding changes which failed to maintain a one-to-one correspondence between old and new codes.

Table 2. Changes in subspecialty coding

Subspecialty code, 1986-87	Subspecialty code, 1988	Subspecialty title, 1988
1526, 1567, 1577	1521	Facial plastic and reconstructive surgery
1527, 1565, 1566	1522	Head and neck surgery
1511, 1541, 1551, 1602, 1631, 1676	1550	Critical care
1617, 1645	1641	Infectious disease
1604, 1633	1643	Cardiologist
1616, 1626, 1644	1644	Adolescent medicine
1619, 1627	1646	Gerontologist
1606, 1635	1647	Gastroenterologist
1607, 1636	1648	Hematologist
1603, 1632	1649	Oncologist
1608, 1637	1650	Hematologist/oncologist
1610, 1639	1652	Allergist/immunologist
1612, 1662	1653	Immunologist
1605, 1634	1654	Endo/metab
1613, 1641	1655	Nephrologist
1588, 1672	1683	Neuropathologist
1589, 1661	1684	Dermatopathologist
1591, 1609, 1638	1686	Hematopathologist
1593, 1611, 1640	1688	Immunopathologist

The physician's second subspecialty code in FY 1988 contains the information necessary to identify the code that the physician had in 1987. However, the change in codes means that it now requires two variables to categorize physicians instead of one. This problem will occur whenever several codes are merged into one. In the retention study, a physician's specialty code in 1987 was used to determine in which of the 23 specialty categories the physician belonged.

The change in specialty codes in 1986 largely avoided the matching problem. However, changes in the coding of physicians in executive medicine created another obstacle to the creation of consistent specialty categories. Prior to 1986, all specialists in executive medicine were grouped together under a single subspecialty code. After 1986, physicians in executive medicine were classified according to their clinical specialty. For example, the subspecialty code of the commanding officer of a hospital who was trained as a surgeon was executive medicine in FY 1985 and surgery in FY 1986.

Billet codes can also indicate whether a physician is in executive medicine. However, the billet codes considered to be executive medicine positions have also changed over time. Table 3 shows the inventory of physicians in executive medicine using subspecialty codes for FY 1983 through FY 1985 and billet codes for FY 1986 through FY 1987. The large increase between FY 1983 and FY 1984 and decrease between FY 1986 and FY 1987 suggest that the method of assigning physicians to the executive medicine subspecialty code changed. The wide variation in inventory levels attests to the difficulties in identifying physicians in executive medicine in a consistent way over time.

Table 3. Inventory of physicians in executive medicine based on the classifications of the time period

<u>Fiscal year</u>	<u>Inventory</u>
1983 <sup>a</sup>	106
1984 <sup>a</sup>	152
1985 <sup>a</sup>	148
1986 <sup>b</sup>	140
1987 <sup>b</sup>	80

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- a. Executive medicine defined by subspecialty code 1500.
- b. Executive medicine defined by billet codes 0002, 0004, 0610, 0690, 3283, 3970, 9087, 9420, 9421, 9436, 9942, 9965, 9970, 9992, 0020, and 0048 in FY 1986, and a subset of those codes in FY 1987.
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These changes in the classification of physicians in executive medicine creates inconsistent specialty categories over time if no adjustments are made. An attempt was made by CNA to create a consistent series of specialty categories by excluding executive medicine personnel from the specialty categories after 1986. All individuals who were classified under the executive medicine subspecialty code in 1985 were excluded from the clinical specialties classifications in 1986 and 1987. A second screen was used to exclude individuals who entered executive medicine after 1985. All individuals who were reported to be in billets currently identified as executive medicine billets were excluded from the specialty categories. (The billet codes include 0002, 0004, 0610, 0690, 3283, 3970, 9087, 9420, 9421, 9436, 9942, 9965, 9970, 9992, 0020, and 0048.) Using this methodology, 153 and 168 physicians were identified as being in executive medicine in FY 1986 and FY 1987 respectively. The specialty retention trends reported in [4] reflect this adjustment.

The main problem for the analysis of retention created by the changes in the coding and definition of executive medicine is maintaining consistency. It matters less whether they are included in the clinical specialties or assigned a separate code than that the procedure be done the same way each year. Maintaining both a separate executive medicine code and the clinical specialty code is preferable for analytic purposes because it allows physicians to be excluded or included depending on the particular analysis.

The analysis of specialty retention examined the behavior of unobligated specialists in addition to the behavior of all specialists from FY 1984 to FY 1988. The OSD was used to distinguish obligated from unobligated physicians in each fiscal year. In theory, only unobligated physicians can choose to leave the Navy. However, each year a number of specialists whose OSD indicated that they were obligated left the Navy. A few records are adjusted to reflect an earlier OSD by the end of the fiscal year in which the physicians leave, as shown in table 4. Involuntary losses may account for some of these cases.

Table 4. Number of physicians who left under obligation

	1984	1985	1986	1987	1988
Obligated based on OSD at beginning of fiscal year	95	74	64	58	56
Obligated based on OSD at end of fiscal year	90	72	57	58	55

One explanation for this finding is that the OSD is incorrect. Another explanation is that these losses are involuntary, due to death, disability, or other reasons; however, examination of the estimated loss code (ELC), a variable that identifies the reason for an impending or actual loss, does not support this explanation. Resolution of this problem would strengthen the analysis of retention by allowing it to focus on physicians who are free to choose to stay in the Navy.

#### CONSTRUCTING A STATISTICAL MODEL OF PAY AND RETENTION

A physician's decision to remain in the Navy depends on a number of factors including the civilian-military pay differential, family responsibilities, personal characteristics, preferences for military service, and number of years of service, which reflects retirement considerations. The effect of pay on retention is of significant interest to the Navy because the Navy can influence the level of military pay for physicians. However, the effect of pay on retention must be quantified within a statistical model that controls for other factors that affect the decision to leave. References [4] and [5] describe the construction of such a model and its application in the evaluation of several alternative pay proposals. This section describes some of the data problems encountered in the development of the retention-pay model.

Military physicians receive both regular military compensation (RMC) and special pays. RMC consists of basic military compensation (BMC), which all members of the armed services receive, and a variable housing allowance (VHA), which varies with the physician's housing area. BMC consists of base pay, basic allowance for quarters (BAQ), basic allowance for subsistence (BAS), and the federal tax advantage that accrues to an individual due to the nontaxable status of the BAQ, BAS, and VHA.

Physicians are also eligible for four types of special pays authorized by the Uniformed Services Health Professionals Special Pay Act of 1980. All active duty military physicians receive variable special pay (VSP). All board-certified physicians receive board-certified pay (BCP). Only physicians who have completed an internship and are not undergoing first residency training can receive additional special pay (ASP). Only physicians qualified and practicing in designated undermanned specialties can receive incentive special pay (ISP). Both ASP and ISP are discretionary. The physician's commanding officer may recommend denial or termination of ASP and ISP for inadequate performance. In addition, physicians must agree to remain on active duty for one year to receive ASP and ISP.

BUMIS does not contain information on RMC but does contain the data that allow most components of RMC to be computed. An individual's RMC varies by grade, years of service, presence of dependents, military housing area, and federal income tax status. No attempt was made by CNA to construct an individual's VHA (if any) or tax advantage. These

components of RMC were estimated using service-wide averages and included in the calculation of each physician's military pay. Base pay, BAQ, and BAS and special pays were calculated according to each physician's individual circumstances.

Concerning data, the main problem affecting the construction of the components of RMC was the number of errors in fields containing information on dependents. A number of observations appeared to contain erroneous information when data on dependents were compared with data on marital status and sex. For example, some physicians were coded both as females and as having wives, while others were coded both as males and as married females with no primary dependents. For over 20 percent of the specialists, the information in the marital status field did not match the marital status indicated by the dependents code. These discrepancies may be due to failure to update the marital status code. For the analysis, physicians were assigned pay based on the dependents code if available. If not, physicians were assigned pay as if they had dependents, because data indicate that most physicians are married.

The FY 1988 end-of-year BUMIS tape does not contain any information on marital status or dependents. Information on dependents was used both to calculate RMC and as an independent variable explaining retention decisions. The presence of dependents tends to increase the probability that a physician leaves the Navy, as discussed in [5]. The lack of information on dependents will make future efforts to replicate the analysis of pay and retention more difficult because this information will have to be obtained from a separate data base such as the Officer Master File. However, improved data collection on marital status and dependents would enable the pay calculations to be more precise.

The BUMIS file is not an adequate source of information on the level of special pay for physicians despite the fact that there are fields devoted to recording special pay information. The file does not contain a record of pay actions disqualifying physicians for the discretionary special pays, ISP and ASP. Although special pay actions are not common, they do occur. In addition, some physicians receiving ASP and ISP will not have the amount recorded in BUMIS because MEDCOM does not receive a copy of the contract. BCP is entered only when the physician first becomes eligible for it, and it is not updated for years of service. A separate field is used to indicate the expiration of the physician's entitlement due to failure to maintain certification. However, the data field showing the amount of board-certified pay is not necessarily updated to reflect this loss of entitlement. The fields containing the special pay amounts contain invalid values. For these reasons, the amount of physician special pays must be determined from data on years of creditable service, specialty, and board certification. This information must be supplemented with information on adverse pay actions gathered from written records. The pay information in BUMIS duplicates pay information available from the Navy Finance Center (NFC). When queried, MEDCOM often checks the information in BUMIS against the data base maintained by NFC. This suggests that one solution to ensuring

that BUMIS contains accurate and up-to-date special pay information is to establish a regular procedure for comparing the information in the two data bases.

#### SUMMARY AND CONCLUSIONS

Medical Corps data in BUMIS provides very detailed information on the physicians in the Navy. However, several improvements in the data base would allow the analysis of retention to be done more quickly and accurately and would allow additional analytical techniques to be employed. Currently, the lack of information on the number of years of obligation a physician incurs through accession makes it difficult to identify the end of a physician's initial obligation. Changes in the coding of specialties and the treatment of physicians in executive medicine make it difficult to create consistent specialty categories. Finally, the lack of up to date pay and pay-related information make the construction of a physician's military pay difficult and, in some cases, inaccurate.

Improvements in the maintenance of the BUMIS data base can result in improved capability to use this data for the analysis of physician retention. The most important change is to create a variable that records the number of years of obligation that a physician incurs through his accession program. This change will make it possible to calculate the end of each physician's initial obligation with much greater accuracy. Second, any changes in the subspecialty codes should be made in a way that retains consistency over time. In particular, old codes should map one-to-one into new codes. In addition, the separate code for executive medicine should be reintroduced. Finally, pay and pay-related variables must be maintained accurately in order to study the influence of pay on retention.

#### REFERENCES

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1. The number in parentheses is a CNA internal control number.